

WHAT IS CLAIMED IS:

1. A method of controlling fertility in a subject, comprising the step of administering to said subject a gonadotropin releasing hormone (GnRH) analog comprising a GnRH peptide conjugated to emodic acid or an emodic acid derivative, or a pharmaceutically acceptable salt or hydrate thereof, in an amount effective to control fertility in said subject.
2. The method of claim 1, wherein the GnRH analog is a GnRH agonist having the formula [D-Lys⁶(Emo)]GnRH, or a pharmaceutically acceptable salt or hydrate thereof, in an amount effective to control fertility in said subject.
3. The method of claim 1, wherein the GnRH analog is a GnRH antagonist having the formula [D-Pyr¹,D-Phe²,D-Trp³,D-Lys⁶(Emo)]GnRH, or a pharmaceutically acceptable salt or hydrate thereof, in an amount effective to control fertility in said subject.
4. The method of claim 1 wherein fertility is controlled to prevent conception in a female subject.
5. The method of claim 1, wherein said subject is a mammal.
6. The method of claim 1, wherein said subject is a human.
7. The method of claim 1, wherein said subject is a non-human mammal.
8. The method of claim 1, wherein said subject is a non-mammalian vertebrate.
9. The method of claim 1, wherein said administering comprises administering a pharmaceutical preparation comprising said GnRH analog, and a pharmaceutically acceptable carrier.
10. The method of claim 9, wherein said administering comprises orally administering said pharmaceutical preparation in solid or liquid dosage form; intravenously, intraarterially, intraperitoneally, subcutaneously, intradermally or intramuscularly injecting said pharmaceutical preparation in liquid form; intravaginally applying said pharmaceutical preparation; administering said

pharmaceutical preparation intranasally or by inhalation; or topically applying said pharmaceutical preparation.

11. The method of claim 9, wherein said pharmaceutical preparation is a pellet, a tablet, a capsule, a solution, a suspension, an emulsion, a gel, a cream, a suppository, a vaginal ring, a depot or a parenteral formulation.
12. A method of contraception in a subject, comprising the step of administering to said subject a gonadotropin releasing hormone (GnRH) analog comprising a GnRH peptide conjugated to emodic acid or an emodic acid derivative, or a pharmaceutically acceptable salt or hydrate thereof.
13. The method of claim 12 wherein the GnRH analog is a GnRH agonist peptide having the formula [D-Lys⁶(Emo)]GnRH, or a pharmaceutically acceptable salt or hydrate thereof.
14. The method of claim 12 wherein the GnRH analog is a GnRH antagonist peptide having the formula [D-Pyr¹,D-Phe²,D-Trp³,D-Lys⁶(Emo)]GnRH, or a pharmaceutically acceptable salt or hydrate thereof.
15. The method of claim 12, wherein said subject is a mammal.
16. The method of claim 12, wherein said subject is a human.
17. The method of claim 12, wherein said subject is a non-human mammal.
18. The method of claim 12, wherein said subject is a female.
19. The method of claim 12, wherein said administering comprises administering a pharmaceutical preparation comprising said GnRH analog, and a pharmaceutically acceptable carrier.
20. The method of claim 19, wherein said administering comprises orally administering said pharmaceutical preparation in solid or liquid dosage form; intravenously, intraarterially, intraperitoneally, subcutaneously, intradermally or intramuscularly injecting said pharmaceutical preparation in liquid form; intravaginally applying said pharmaceutical preparation; administering said

pharmaceutical preparation intranasally or by inhalation; or topically applying said pharmaceutical preparation.

21. The method of claim 19, wherein said pharmaceutical preparation is a pellet, a tablet, a capsule, a solution, a suspension, an emulsion, a gel, a cream, a suppository, a vaginal ring, a depot or a parenteral formulation.
22. A method of treating a sex hormone-related disease or condition in a subject, said method comprising the step of administering to said subject a gonadotropin releasing hormone (GnRH) analog comprising a GnRH peptide conjugated to emodic acid or an emodic acid derivative, or a pharmaceutically acceptable salt or hydrate thereof, in an amount effective to treat said disease or condition in said subject.
23. The method of claim 22 wherein the GnRH analog is a GnRH agonist peptide having the formula [D-Lys⁶(Emo)]GnRH, or a pharmaceutically acceptable salt or hydrate thereof, in an amount effective to treat said disease or condition in said subject.
24. The method of claim 22 wherein the GnRH analog is a GnRH antagonist peptide having the formula [D-Pyr¹,D-Phe²,D-Trp³,D-Lys⁶(Emo)]GnRH, or a pharmaceutically acceptable salt or hydrate thereof, in an amount effective to treat said disease or condition in said subject.
25. The method of claim 22, wherein said disease or condition is prostate cancer, breast cancer, ovarian cancer, cervical cancer, a tumor of the pituitary, testicular cancer or uterine cancer.
26. The method of claim 22, wherein said disease or condition is a benign disease or condition.
27. The method of claim 26, wherein said disease or condition is benign prostatic hyperplasia, precocious puberty, aberrant sexual behavior, late luteal phase dysphoric disorder (premenstrual syndrome), fibroids, endometriosis, myoma, hirsutism, cyclic auditory dysfunction, porphyria, or polycystic ovarian syndrome.

28. The method of claim 22, wherein said subject is a mammal.
29. The method of claim 22, wherein said subject is a human.
30. The method of claim 22, wherein said subject is a non-human mammal.
31. The method of claim 22, wherein said subject is a male.
- 5 32. The method of claim 22, wherein said subject is a female.
33. The method of claim 22, wherein said administering comprises administering a pharmaceutical preparation comprising said GnRH analog, and a pharmaceutically acceptable carrier.
- 10 34. The method of claim 33, wherein said administering comprises orally administering said pharmaceutical preparation in solid or liquid dosage form; intravenously, intraarterially, intraperitoneally, subcutaneously, intradermally, intralesionally or intramuscularly injecting said pharmaceutical preparation in liquid form; intravaginally applying said pharmaceutical preparation; administering intranasally or by inhalation; or topically applying said pharmaceutical preparation.
- 15 35. The method of claim 33, wherein said pharmaceutical preparation is a pellet, a tablet, a capsule, a solution, a suspension, an emulsion, a gel, a cream, a suppository, a vaginal ring, a depot or a parenteral formulation.
- 20 36. A method of preventing a sex hormone-related disease or condition in a subject, said method comprising the step of administering to said subject a gonadotropin releasing hormone (GnRH) analog comprising a GnRH peptide conjugated to emodic acid or an emodic acid derivative, or a pharmaceutically acceptable salt or hydrate thereof, in an amount effective to prevent said disease or condition in said subject.
- 25 37. The method of claim 36 wherein the GnRH analog is a GnRH agonist peptide having the formula [D-Lys⁶(Emo)]GnRH, or a pharmaceutically acceptable salt or hydrate thereof, in an amount effective to prevent said disease or condition in said subject.

38. The method of claim 36 wherein the GnRH analog is a GnRH antagonist peptide having the formula [D-Pyr¹,D-Phe²,D-Trp³,D-Lys⁶(Emo)]GnRH, or a pharmaceutically acceptable salt or hydrate thereof, in an amount effective to prevent said disease or condition in said subject.
- 5 39. The method of claim 36, wherein said disease or condition is prostate cancer, breast cancer, ovarian cancer, cervical cancer, a tumor of the pituitary, testicular cancer or uterine cancer.
40. The method of claim 36, wherein said disease or condition is a benign disease or condition.
- 10 41. The method of claim 40, wherein said disease or condition is benign prostatic hyperplasia, precocious puberty, aberrant sexual behavior, late luteal phase dysphoric disorder (premenstrual syndrome), fibroids, endometriosis, myoma, hirsutism, cyclic auditory dysfunction, porphyria, or polycystic ovarian syndrome.
- 15 42. The method of claim 36, wherein said subject is a mammal.
43. The method of claim 36, wherein said subject is a human.
44. The method of claim 36, wherein said subject is a male.
45. The method of claim 36, wherein said subject is a female.
- 20 46. The method of claim 36, wherein said administering comprises administering a pharmaceutical preparation comprising said GnRH analog, and a pharmaceutically acceptable carrier.
- 25 47. The method of claim 47, wherein said administering comprises orally administering said pharmaceutical preparation in solid or liquid dosage form; intravenously, intraarterially, intraperitoneally, subcutaneously, intradermally, intralesionally or intramuscularly injecting said pharmaceutical preparation in liquid form; intravaginally applying said pharmaceutical preparation; administering intranasally or by inhalation; or topically applying said pharmaceutical preparation.

48. The method of claim 47, wherein said pharmaceutical preparation is a pellet, a tablet, a capsule, a solution, a suspension, an emulsion, a gel, a cream, a suppository, a vaginal ring, a depot or a parenteral formulation.
- 5 49. A method of promoting the release of LH or FSH in a subject, comprising the step of administering to said subject a gonadotropin releasing hormone (GnRH) analog comprising a GnRH peptide conjugated to emodic acid or an emodic acid derivative, or a pharmaceutically acceptable salt or hydrate thereof, in an amount effective to promote the release of LH or FSH in said subject.
- 10 50. The method of claim 49 wherein the GnRH analog is a GnRH agonist peptide having the formula [D-Lys⁶(Emo)]GnRH, or a pharmaceutically acceptable salt or hydrate thereof, in an amount effective to promote the release of LH or FSH in said subject.
51. The method of claim 49, wherein said subject is a mammal.
52. The method of claim 49, wherein said subject is a human.
- 15 53. The method of claim 49, wherein said subject is a non-human mammal.
54. The method of claim 49, wherein said subject is a non-mammalian vertebrate.
55. The method of claim 49, wherein said subject is a male.
56. The method of claim 49, wherein said subject is a female.
- 20 57. The method of claim 49, wherein said administering comprises administering a pharmaceutical preparation comprising said GnRH analog peptide, and a pharmaceutically acceptable carrier.
- 25 58. The method of claim 57, wherein said administering comprises orally administering said pharmaceutical preparation in solid or liquid dosage form; intravenously, intraarterially, subcutaneously, intradermally, intraperitoneally or intramuscularly injecting said pharmaceutical preparation in liquid form; intravaginally applying said pharmaceutical preparation; administering intranasally or by inhalation; or topically applying said pharmaceutical preparation.

59. The method of claim 57, wherein said pharmaceutical preparation is a pellet, a tablet, a capsule, a solution, a suspension, an emulsion, a gel, a cream, a suppository, a vaginal ring, a depot or a parenteral formulation.
60. A method of preventing the release of LH or FSH in a subject, comprising the
5 step of administering to said subject a gonadotropin releasing hormone (GnRH) analog comprising a GnRH peptide conjugated to emodic acid or an emodic acid derivative, or a pharmaceutically acceptable salt or hydrate thereof, in an amount effective to promote the release of LH or FSH in said subject.
61. The method of claim 60 wherein the GnRH analog is a GnRH agonist peptide
10 having the formula [D-Lys⁶(Emo)]GnRH, or a pharmaceutically acceptable salt or hydrate thereof, in an amount effective to prevent the release of LH or FSH in said subject.
62. The method of claim 60 wherein the GnRH analog is a gonadotropin releasing hormone (GnRH) antagonist peptide having the formula [D-Pyr¹, D-Phe², D-Trp³, D-Lys⁶(Emo)]GnRH, or a pharmaceutically acceptable salt or
15 hydrate thereof, in an amount effective to prevent the release of LH or FSH in said subject.
63. The method of claim 60, wherein said subject is a mammal.
64. The method of claim 60, wherein said subject is a human.
65. The method of claim 60, wherein said subject is a non-human mammal or a
20 non-mammalian vertebrate.
66. The method of claim 60, wherein said subject is a male.
67. The method of claim 60, wherein said subject is a female.
68. The method of claim 60, wherein said administering comprises administering
25 a pharmaceutical preparation comprising said GnRH analog, and a pharmaceutically acceptable carrier.
69. The method of claim 68, wherein said administering comprises orally administering said pharmaceutical preparation in solid or liquid dosage form;

intravenously, intraarterially, subcutaneously, intradermally, intraperitoneally or intramuscularly injecting said pharmaceutical preparation in liquid form; intravaginally applying said pharmaceutical preparation; administering intranasally or by inhalation; or topically applying said pharmaceutical preparation.

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70. The method of claim 68, wherein said pharmaceutical preparation is a pellet, a tablet, a capsule, a solution, a suspension, an emulsion, a gel, a cream, a suppository, a vaginal ring, a depot or a parenteral formulation.

71. A long acting gonadotropin releasing hormone (GnRH) analog comprising a GnRH peptide conjugated to emodic acid or an emodic acid derivative, or a pharmaceutically acceptable salt or hydrate thereof, other than D-Lys⁶(Emo)GnRH.

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72. A GnRH analog according to claim 71 wherein the analog is an agonist having the formula: Pyr-His-Trp-Y-Tyr-X-Leu-Arg-Pro-Z

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wherein X is selected from Ser(Emo), D-Ser(Emo), Lys(Emo), D-Lys(Emo), D-Dab(Emo), D-Orn(Emo), D-hSer(Emo); Y is selected from D-Lys(Emo), D-Dab(Emo), D-Orn(Emo), D-Ser(Emo), D-hSer(Emo); Z is selected from Gly, Ethylamine, D-Ala; Pyr denotes pyroglutamic acid, Dab denotes diaminobutyric acid; Emo denotes emodic acid or an emodic acid derivative; and pharmaceutically acceptable salts, amides, esters and hydrates thereof.

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73. A gonadotropin releasing hormone (GnRH) antagonist peptide having the formula:

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i) [D-Pyr¹, D-Phe², D-Trp³, D-Lys⁶(Emo)]GnRH, or a pharmaceutically acceptable salt or hydrate thereof;

ii) Ac-D-Nal-4-chloro-D-Phe-β(3-Pyridyl)-D-Ala-X-Y-Z-Leu-W-Pro-D-Ala

wherein, X is selected from Ser(Emo), hSer(Emo); Y is selected from Lys(Emo), Dab(Emo), Z is selected from D-Lys(Emo), D-Dab(Emo), D-Orn(Emo), D-Ser(Emo) D-hSer(Emo); W is selected from Lys(Emo),

Dab(Emo), Orn(Emo), Ser(Emo), hSer(Emo); and pharmaceutically acceptable salts, esters, amides and hydrates thereof.

iii) Ac-Nal-4-chloro-D-Phe-D-Pal-X-Tyr-Y-Leu-Arg-Pro-D-Ala

5 wherein X is selected from Ser(Emo), hSer(Emo); Y is selected from D-Cit(Emo), D-Lys(Emo), D-Dab(Emo), D-Orn(Emo), D-Ser(Emo) D-hSer(Emo); D-Nal denotes D-3-(2'-naphthyl)-alanine; D-Pal denotes 3-(3'-pyridyl)-alanine; and pharmaceutically acceptable salts, amides, esters and hydrates thereof.

10 74. A pharmaceutical preparation comprising as an active ingredient a GnRH analog according to any one of claims 71-73, and a pharmaceutically acceptable carrier or diluent.